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UNITED NATIONS WORKSHOP ON SPACE COMMUNICATIONS FOR DEVELOPMENT

(Havana, 26-30 March 1990)

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INTRODUCTION

A. Background and objectives

1. At its thirty-seventh session, in 1982, the General Assembly adopted resolution 37/90 of 10 December 1982, in which it endorsed the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82). In that resolution, the Assembly directed, among other things, that the United Nations Programme on Space Applications should promote the dissemination of information on advanced space applications and new system developments among managers and decision-makers, particularly for the benefit of the developing countries.

2. The United Nations Workshop on Space Communications for Development was one of the activities of the Programme for 1990 that were endorsed by the General Assembly in its resolution 44/46 of 8 December 1989. The Workshop was co-sponsored by the Government of Cuba and hosted by the Academy of Sciences and the Ministry of Communications of Cuba in Havana, from 26 to 30 March 1990, for the benefit of participants from the Economic Commission for Latin America and the Caribbean (ECLAC) region.

3. The Workshop was organized to provide an opportunity for the exchange of information on the technical and operational issues associated with various international/regional communications satellite systems and services. The Workshop reviewed the status and projected direction of the technology, with emphasis on the current and future developments in rural communications, particularly in its application to education, medicine, search-and-rescue missions and disaster relief operations. The Workshop also focused on aspects of space communications in which the developing countries could make contributions, including the design and construction of small Earth Stations and the establishment of network services for education and health data communication purposes.

4. The present report, which covers the background, objectives and organization of the Workshop, the observations and recommendations made during discussions at the Workshop as well as a summary of the lectures presented, has been prepared for the Commiteee on the Peaceful Uses of Outer Space and its Scientific and Technical Sub-Committee. The participants will report to the appropriate authorities in their respective countries.

B. Organization and programme of the Workshop

5. The Workhop participants were invited in their personal capacity as experts with several years of professional experience in various fields of satellite communications, telecommunications, educational broadcasting systems and in the operation of satellite communications centres. Fifty-seven participants attended the Workshop from the following Member States and regional and international organizations: Argentina, Bahamas, Canada, Cuba, Dominican Republic, Ecuador, France, Guyana, Italy, Jamaica, Mexico, Peru, Spain, Saint Vincent and the Grenadines, Trinidad and Tobago, Union of Soviet Socialist Republics, United States

of America, Uruguay, Venezuela, Caribbean Community (CARICOM) Communications Unit, the International Maritime Organization (IMO), the International Maritime Satellite Organization (INMARSAT), the International Telecommunications Satellite Organization (INTELSAT), the International Organization of Space Communications (INTERSPUTNIK), the International Telecommunication Union (ITU), the United Nations Disaster Relief Organization (UNDRO) and the United Nations (Outer Space Affairs Division).

6. Funds allocated by the co-sponsors for the organization of the Workshop were used to cover the cost of international air travel and a daily subsistence allowance for 15 participants to cover board and incidental expenses; room accommodations for participants from developing countries, conference facilities and local transportation were provided by the Ministry of Communications and the Academy of Sciences of Cuba.

7. Opening addresses were presented by Mr. Manuel Castillo Rabassa, Minister of Communications of Cuba, on behalf of the Government of Cuba, and by Mr. Nandasiri Jasentuliyana, Chief, United Nations Outer Space Affairs Division on behalf of the United Nations.

8. The programme of the Workshop (see annex I to the present report) was developed by the United Nations in consultation with the Ministry of Communications and the Academy of Sciences of Cuba. The Workshop was conducted through a series of plenary and working group sessions. At the latter, the participants made the observations and recommendations that follow.

I. OBSERVATIONS AND RECOMMENDATIONS

A. Observations of the Workshop

9. The establishment of satellite communication links can be a more economically and technologically feasible solution to rural communication problems than the use of direct wire, optical fibre or microwave repeater networks when the large distances that separate small rural communities from the rest of the country and the often inhospitable topography of the terrain are taken into consideration.

10. Satellite-assisted technologies that can provide the services and information that are essential for the social and economic development of a country are now available. At the same time, the promise that satellite technology holds for providing basic telecommunications service to all parts of the world, or even within a country, has not been fulfilled, particularly in isolated and sparsely settled areas of developing countries. The main reason for this situation is the high cost of Earth stations that are required to interface with the present generation of communications satellites.

11. However, work is in progress in the design and construction of the next generation of more powerful communications satellites which will operate in conjunction with far smaller Earth stations. The costs associated with these new Earth stations will be several orders of magnitude less than the present generation of Earth stations. It is expected that rapid developments in practical

communications systems based on the new technologies will offer more applications opportunities for satellite communications.

12. From among the various applications of satellite communications, the Workshop identified rural communications, and in particular transmission and distribution of information, tele-education and dissemination of education programmes, tele-medicine and disaster relief operations, as the applications which, with modest investment, can make substantive contributions to national and regional development.

13. While a number of technical systems and programmes already exist, various potential users are still unaware of the benefits that could result from the applications of satellite comunications in health, education and other government services as well as in specific actions that are part of disaster relief operations. There is clearly a need to inform the professionals and decision-makers of the various institutions dealing with the above-mentioned fields, of the potential applications and of the necessary steps to be taken in order to benefit from the technological advances.

14. Networks that utilize satellite links to provide access to data banks around the world are becoming an essential tool for scientific and technological development. Within the ECLAC region, a number of nodes are being established, primarily at universities and research institutions, that allow a user to have access to most of the data banks in the United States and Canada as well as many others in Europe and other regions of the world.

15. The development of new applications or the solution of existing problems in the ECLAC region cannot be achieved by the use of the technology itself without the support of individuals directly involved in the technology development process. There should be continuing efforts to provide education and training opportunities, both within and outside the ECLAC region, for professionals in all the research and applications areas associated with satellite communications. Some degree of experience that is indigenous to the ECLAC region already exists through the involvement in interactive satellite and land communications in countries such as Argentina, Brazil, Mexico and the States of the West Indies. Such experience can help to preserve the cultural heritage and to promote regional co-operation in the development of educational programmes, the establishment of communication links, the design, construction and operation of Earth stations and the establishment of joint actions to be taken in case of hurricanes and other hydrometeorological phenomena.

16. In particular, there is a well-developed distance education programme which is operational in the Caribbean region. This system, known as the University of the West Indies Distance Tele-Education (UWIDITE) network, links nine countries of the Caribbean region and has had communication links with Canada for a number of years. Jointly with the Memorial University, Newfoundland, UWIDITE is now developing a teleconference system in Jamaica. Both the tele-education system and the teleconference system are based on telephone communication technology which is accessible to the entire ECLAC region.

B. General recommendations

17. On the basis of the above observations, the Workshop focused its recommendations on the technical aspects of the applications of satellite communications in the following three areas:

(a) Satellite applications to education with emphasis on the development of the infrastructure necessary for rural education (hardware, software and development of educational programmes);

(b) Satellite applications to medicine, with emphasis on support for rural hospitals, doctors and paramedical personnel;

(c) Satellite applications to disaster relief operations, with emphasis on the development of the required infrastructure and of plans for joint actions in case of emergencies.

18. The Workshop noted that as a result of the rapid development and the accompanying reduction in cost of a number of associated technologies such as computing systems, video equipment, fibre optics and other transmission equipment and very small aperture terminals (VSATs), the participation of scientific and governmental institutions of the ECLAC region in the development of the infrastructure required for the applications identified in paragraph 17 is an attainable goal.

19. In addition, much of the development of the infrastructure necessary for rural education applications could be utilized as well, possibly with small modifications, for applications in health-related fields, and both could serve as an experience base for the development of infrastructure intended for disaster relief operations.

20. Technical working groups should be formed at the national level to develop strategies and co-ordinate the development of the necessary infrastructure. These working groups should identify a focal point that could serve as a regional exchange of experiences, including the development and implementation of joint regional/subregional projects.

21. Several countries of the ECLAC region have developed diverse capabilities in the design and construction of satellite-receiving antennas, integration and operation of Earth stations and the operation and control of their own satellite systems. The countries of the region should identify specific co-operative ventures which can make use of this existing experience. One of such ventures could be the establishment of regional education centres dealing with all aspects of space communications.

22. Technical co-operation between the Latin America and the Caribbean subregions should be increased. Initially, this goal might be achieved through the establishment of a distance education programme; such a programme should take cognizance of the language and cultural differences. Another area in which the two subregions could complement their efforts is in the establishment of a programme to study and evaluate hydrometeorological phenomena, including concerted plans for

eventual disaster relief operations. The design and implementation of a regional telecommunications network can also be undertaken as a co-operative programme of the entire ECLAC region.

C. Specific recommendations

23. Research and academic communications network. A regional network through which information and data on ongoing projects could be exchanged between data bases would enhance the productivity of the academic and research communities in the region. Such a network, possibly operating at a rate of 64k bits per second (bps), could have a gateway through which it could be linked to similar, existing networks in the industrialized countries.

24. The main constraints in establishing such a network are not technical in nature but are rather of an economic and legislative character. It would be necessary to establish financing mechanisms and to promote the necessary legislation in the appropriate forums. A feasible option would be to interconnect the public data networks which have normalized communications protocols and which are being used by the majority of the countries in the region. It is also necessary to determine the current state of data communications in each country, to establish the topology of the network and to enter into the corresponding agreements.

25. Development, production and transmission of scientific, educational and cultural programmes. A working group of experts in communications should be established to study the possibilities of time-sharing in the space segment of the Mission TV-America portion of the HISPASAT (of Spain) satellite system to be launched in 1992. The working group, which should include experts from both the ECLAC region and from Spain, would identify the scientific, educational and cultural needs of the ECLAC region that could be met through high- or low-resolution television broadcasts of the HISPASAT system, in a manner similar to the use of the Olympus satellite among countries of the European Economic Community.

26. The working group should also identify specific co-operation programmes which might include the following:

(a) Establishment of direct collaboration links between the technical and administrative departments of the HISPASAT system and the departments of telecommunications and tele-education of universities and governmental institutions of the ECLAC region;

(b) Development of project proposals to co-produce high-quality audiovisual programmes in the areas indicated in paragraph 25 above;

(c) Establishment of a follow-up mechanism to implement the project proposals that are selected.

27. Audio/visual teleconferencing. The ECLAC region should develop its teleconferencing capabilities. Governments or institutions of the region should consider initiating a low-cost project that could initially use the existing

telephone system to establish audio teleconferencing sites. A number of the countries in the ECLAC region that already have audio teleconference links to several sites in Canada could, through the establishment of a teleconference bridge, located either in the region or in Canada, become linked to one another as well as for multi-point teleconferencing. Telewriters and digital slow-scan units could be added at a later stage.

28. The basic teleconference system described above could then be enhanced through the addition of facsimile services and electronic mail (E-mail) at the sites where the infrastructure makes it feasible. A further development of the teleconferencing system would be achieved through the use of a region-wide satellite with video transmission capabilities to provide an interactive capability.

29. The establishment of such a system in stages would provide education and training both in the development of the system and in its applications. The applications would include, among others, the following:

(a) Possibilities for continuing education of health professionals;

(b) University-level education for groups at polytechnics, for health and education administrators and for the scientific and technical communities at large;

(c) Education possibilities for specialized governmental agencies dealing with agriculture, mineral resources, fisheries and other concerns of national interest.

30. Maritime/air disaster relief. Co-operation between Caribbean and Central American countries in developing rescue plans in cases of maritime and air disasters in the subregion should be promoted. For this purpose, the countries of the Caribbean and Central America subregions should initiate a pilot project that would expedite the exchange of information on maritime and air disasters that occur in the area, using satellite and other appropriate technology. This exchange of information would be between the centres in charge of co-ordinating rescue information and the offices of the authorities responsible for the actual rescue operations.

31. The project should include training programmes on the satellite technology to be used in order to enhance the knowledge of the participating personnel. The implementation of the above proposal would supplement the maritime safety and rescue plan proposed by the International Maritime Organization for this subregion; to date there is no dedicated infrastructure in the region for this purpose.

32. Education and training. A programme should be established by the countries of the Latin America and Caribbean region to educate and train individuals from the region in all aspects of satellite communications. Such a programme could be developed in different phases and should be implemented at several locations, but should make maximum use of the experience already gained by the countries in the region. The programme should emphasize the principles necessary to develop, operate and maintain the communication infrastructure required for applications to rural medicine and education as well as disaster relief preparedness and response.

33. Promotion of regional co-operation. The workshop participants resolved to inform the appropriate authorities in their home countries of the observations and recommendations contained in the present report. They also resolved to seek and propose solutions that are technically and economically feasible for the ECLAC region, keeping in mind the satellite systems that are already operational in the region as well as those that are being developed.

34. The possibilities for regional co-operation using the existing and proposed satellite systems (e.g. BRASILSAT, MORELOS, SIMON BOLIVAR, PANAMSAT, INTELSAT, INTERSPUTNIK, HISPASAT) that cover the ECLAC region should be analysed at a meeting of experts convened for the purpose by the countries of the region.

D. Follow-up to the recommendations

35. As a follow-up to the recommendations contained in paragraphs 25 and 26 above, the Government of Spain, through its Ministry of Communications, organized the "First Ibero-American Meeting on Communications for Co-operation", which was held at Madrid from 5 to 7 June 1990. The Meeting was attended by representatives of sixteen ECLAC member States represented at the level of Ministers, Secretaries of State, Under-Secretaries and Directors-General of the telecommunications and education institutions of their countries.

36. The Meeting addressed the need to find ways to establish co-operation in the area of space communications between Spain and countries from Latin America and the Caribbean. In particular, the participants considered the opportunities that would be available with the launching of the HISPASAT satellites in 1992. The Meeting considered that such co-operation should promote the identity and integration of the participating countries, with emphasis on the educational, scientific and cultural aspects. The agreements reached by the participants are contained in annex II to the present report.

II. SUMMARY OF PRESENTATIONS

A. New and emerging communications technologies

37. New technologies have, in general, been developed in the industrialized countries and their use has been virtually confined within such countries. Satellites, and in particular those utilized for communications, represent the first area in which the developing countries utilize state-of-the-art technology. Rapid developments and refinements in communications and related technologies have resulted in a steady reduction of the cost of delivering information via satellite. The development of powerful satellites has resulted in the development of smaller satellite-receiving terminals; the new tariffs that have arisen bear witness to the fact that developing countries should benefit more widely from the use of space communications.

38. The next generation of communications satellites, in conjunction with the use of fibre optics, will provide vast opportunities for economic and social

development. While advances in communications technology are dramatically changing traditional work as well as education and entertainment patterns, many people are unable to gain access to or accommodate changes brought about by the information revolution. The limiting factors include the lack of financial resources, the absence of education and training opportunities, geographical isolation in rural environments and local policies.

39. Lack of information and knowledge of the new communications technologies exists throughout the world, but it is more acute in the developing countries. Although these problems are country-specific, a large number of similar conditions exist in many countries; thus many solutions can be found in the sharing of resources, co-operation and collaboration in the planning and group purchasing of communications hardware and software.

40. It is both exciting and challenging to contemplate the range of advanced technologies and the services made possible by them, services which are becoming increasingly available to communicators. The new communication technologies and services are having a favourable impact on the cost of carrying out various tasks. At the same time, it is becoming difficult to distinguish between technologies and services, especially as communications and computers converge. However, it should not be necessary to distinguish between them; a truly effective technology (and the services it enables) should be transparent to the user. Thus, in the paragraphs that follow the interaction between broadcasting, both audio and visual, and data transmission with computers and other telecommunication devices will be referred to simply as "communications".

41. The array of new technologies and services which now exist, and which are sometimes being aggressively promoted and marketed as solutions to all communications problems, is truly staggering. The emerging technologies are being put to use and are seen by some as meeting the needs of the current information era. In order to make appropriate national development decisions, it is necessary that those selecting the technologies and services, particularly in countries with very limited resources, be aware of their existence, their advantages and drawbacks and of the expected development trends. What follows is a sample of existing communications technologies; some of these are not necessarily adaptable to, or cannot be afforded by, all countries.

42. Transmission and service technologies currently receiving attention include low Earth orbit, direct broadcasting and mobile communications satellites, VSATs and ultra small aperture terminals (USATs), fibre optics transmission, cable systems, freeze frame/slow-scan television, mobile and cellular telephony, AM, FM and shortwave radio and television broadcasting, wireless telegraphy, amateur radio and low-power television, wireless cable service, digital radio, Integrated Services Digital Networks (ISDN), world-wide paging systems, facsimile, packet switching, remote data collection systems, voice mail, telephone bridges, voice-operated computers and word processors, optical disc technology including CD-ROMs (Read Only Memory) and WORMs (Write Once, Read Many times), conventional and satellite news gathering units, audio, video and computer teleconferencing, high-resolution television, dedicated network services, data networks, local area networks (LAN), speech synthesizers, automatic translation, machine reading of printed or typed text, video text and teletext.

43. In many countries, short-wave radio continues to be the primary means of broadcasting despite the fact that its quality and reliability are inferior to other technologies available. Similarly, the International Committee of the Red Cross uses wireless telegraphy although it is not the best means of communication for dealing with a disaster situation. In both of these cases, the choice of technology is limited by the communications infrastructure in place. As illustrated by these two examples, the existence of new technologies does not imply that they are immediately available everywhere. Planners in the developing countries must keep in mind the local conditions and existing infrastructure before making any communication investment.

44. The emerging technologies cannot be seen in isolation. It is necessary to study the process of acceptance and effective utilization of innovative technologies. This process begins with awareness of the technologies, although awareness by itself does not ensure understanding. Similarly, understanding does not always lead to acceptance, and acceptance does not guarantee utilization. The complete process is dependent on such variables as commitment, policy, advocacy, attitudes, resources, time, education and integration of efforts. Other variables that need to be considered include the cost, adaptability, and compatibility of the equipment, including its subsequent reliability and obsolescence. A final but no less important consideration is the careful planning of the operation and the maintenance of these new technologies.

45. Most telecommunications planners believe that a single system, whether it be fibre optics, satellite or microwave, is not in the best interest of a country, but that multiple and complementary delivery modes will best serve diverse needs. In most developing countries, it is doubtful that fibre optics will be an adequate communication mode in the foreseeable future. Fibre optics require a large capital investment, especially if there is a political commitment to provide service to all communities, including isolated and rural areas.

46. While some of the technologies listed above are still not operational, several others, such as optical computers, artificial intelligence, parallel processors and even biological computers, are now being developed. This trend will result in more efficient and less expensive computing and communications systems. Data bases and data banks will proliferate and remote access to them will become easier. Satellites will most likely carry the bulk of transoceanic television traffic and fibre optics will pick up and relay the signals to certain areas. Domestic satellites, combined with cellular or mobile technologies, will carry transmitted messages to final destinations. There will also be low Earth orbiting satellites that are capable of transmitting electronic mail and data using burst transmissions and a store-and-forward messaging technique linked to microcomputers. The latter would provide a new utility to packet broadcasting while the use of mobile and cellular telephony could provide large savings in wire costs.

47. The new generation of communications satellites will have higher power on board as well as the ability to address, either at a single location or through hopping spot beams, many locations at once. These satellites will utilize Ka-band frequencies that will make the transmission of voice, video and data more efficient and cost-effective. Such improvements will be accomplished by higher transmission

frequencies, broader bandwidth, on-board switching and steerable antennas. These new satellites will be operational in the 2,500 MHz range, in contrast to the 500 MHz available in the C and Ku bands. The use of hopping spot beams will also enable frequency reuse, thus making better use of the available frequency spectrum.

48. The new generation of satellites will expand the range of communications services to include such health care techniques as medical imaging that will be available to rural areas. Businesses will also be able to be established outside costly urban areas and still have access to the communications capabilities they need.

B. Establishing a satellite communications infrastructure

49. The growth and development of satellite communications has been, and is likely to continue to be, very rapid. The Intelsat I satellite, launched in 1965, received and transmitted 240 voice circuits and one television channel. The Intelsat VI satellite, launched in 1988, has a capacity for 120,000 simultaneous two-way telephone circuits and three television channels. Since INTELSAT, INTERSPUTNIK and INMARSAT are international co-operatives, their services are available to individual countries and to regional groups of countries. Thus, planners can find optimum combinations of infrastructure that would satisfy the cultural, economic and development requirements of their countries.

50. Most countries of the world have established satellite communications infrastructures without necessarily owning and operating a satellite system. Organizations such as INTELSAT, INTERSPUTNIK and INMARSAT and a host of regional satellite systems can provide, at a cost, the necessary space segment. These satellites are used to relay data, voice, video or audio between Earth stations which are privately or publicly owned networks. At present, network services are not necessarily supported by large systems, but often by smaller ones that utilize intelligent, digital Ku-band VSATs. The services supported by such small systems include interactive and broadcast data communications, telephony and a full range of video services.

51. For some specific applications, it is possible to obtain a free use of the space segment for a limited time period from some of the above-mentioned international organizations. In particular, the INTELSAT Project Access provides use of the space segment, gratis, for applications in the areas of health, education or social services or for projects that provide communication means for regions with little or no communications infrastructure. Project access was designed to support projects with rural applications with emphasis on the possibility of establishing commercial services in the future. The application forms that need to be completed can be obtained directly from Project Access, Office of the Director of Service Assistance and Development, at INTELSAT headquarters. INTERSPUTNIK also provides free use of the space segment for special projects on an ad hoc basis; information on the possibility of establishing such an agreement can be obtained directly from the Director General of INTERSPUTNIK at the headquarters of that organization.

52. Direct connection of data terminal equipment installed at the final user's premises to a main data processing or information storage facility (i.e., the host computer) is now possible with the aid of communication satellites. Such applications, whether related to business, public services or scientific matters, are usually carried out in the framework of dedicated satellite networks which can substitute for terrestrial networks. One type of these satellite networks uses a star architecture, with the main station (i.e., the "hub" station) being located at the centre and the microstations (very small aperture terminals (VSATs)) at the user's premises. VSAT network operation and management is controlled by a network control centre which is usually located at the hub. This design offers performance similar to existing data and information terrestrial networks and utilizes the most common user-network interconnections and interface protocols.

53. In VSAT networks, information is transmitted by grouping the data into "packets" before transmission; this is an internal software process. However, users of this process are not limited to packet-oriented transmissions because the packetizing functions can be performed at the interfacing units of the VSAT terminals. Thus an important feature of VSAT networks is the capacity to broadcast information from the hub to all VSATs or to a group of them through an appropriate addressing scheme. Although VSATs do not operate in the high rate of transmission range, most terminals operate at a rate of 64k bps (or even a multiple thereof), which makes them useful for a wide range of commercial and public service applications.

54. In a satellite link, the high performance of one of the end terminals compensates for the modest performance of the other end terminal. For this reason, networks usually adopt an architecture with a high-performance hub station and small end terminal stations. Usually, the latter cannot intercommunicate directly with an acceptable quality of transmission. However, they can intercommunicate through the satellite and the hub station using a "double hop" technique. The longer time associated with this technique is not in itself important, but error correction becomes more difficult since a large quantity of data is transmitted before an error signal is received.

55. The use of communication networks similar to those described above, in combination with computers and the appropriate software, can provide analysts and decision-makers with access to statistical data bases from which they can remotely retrieve, analyse and update information. The use of statistical data bases in banking, air travel and hotel bookings, credit card verification and centralized merchandise stock control are well known. There is also a large number of national, regional and global statistical data bases which contain population census reports, economic indicators and social and scientific factual data. The United Nations system alone operates directly or indirectly 632 such data bases on a vast number of subjects pertaining to their spheres of competence. Some of these data bases are for internal access only, but an ever growing number of them are being made accessible to external users. ITU is implementing a pilot project known as Telecommunication Exchange Services which will allow external users to access ITU data bases.

C. Communications for health and education applications

56. Considerable experience in establishing a rural communications network for health care delivery and for educational purposes has been acquired by the Memorial University of Newfoundland in Canada. The University started a Tele Conference System (TCS) in 1978 as a dedicated four-wire audio system that now includes 170 sites throughout Newfoundland and Labrador. These facilities have been installed in all hospitals, some clinics, in all community colleges and university campuses and in many government offices. TCS includes a 20-port teleconference bridge which links individuals or groups, both nationally and internationally, that are not part of the system. TCS has recently been enhanced through the addition of technical equipment, including slow-scan television, electroencephalogram and electrocardiograph transmission, telewriters, electronic mail and facsimile transmission.

57. Through its SHARE project, the University's Telemedicine Centre has already used slow-scan transmissions in its shared programming with the University of the West Indies Distance Tele-Education (UWIDITE) network. A second component of the same project is a link between TCS and the University of the West Indies campus at Jamaica. As a result of this project, the two universities are in the process of designing and implementing a radio-based teleconference network between four sites in Jamaica that could be interfaced with UWIDITE or operated separately. These co-operative efforts would also broaden the educational programme base of both UWIDITE and the intra-Jamaica systems and develop a variety of shared programmes between the two universities.

58. The UWIDITE network, which now links nine countries in the Caribbean region, has successfully mounted distance teaching programmes for teachers, doctors, nurses, university students, technicians and professionals of various disciplines. In this manner the network has allowed the sharing of valuable expertise existing in the different countries within the region as well as internationally. The goal of UWIDITE is now to increase the amount of programming developed in the Caribbean to include more elements of the culture of the region.

D. Maritime applications

59. The Standard-C system is an INMARSAT advanced, low-cost packet data communications system supported by small mobile Earth stations. The system offers two-way message communication services and data transmission using a storage-and-forward technique designed to interconnect with the International Telex Network as well as with a large variety of data networks (X.25, X.400, etc.). In addition, the Standard-C system will allow for one-way radio communications across the ocean through a system known as Enhanced Group Call (EGC). The EGC system provides a global service capable of addressing messages or data to a predetermined group of both mobile and fixed stations.

60. It is in maritime communications that the Standard-C system finds its greatest applications. Some of the advantages of maritime mobile communications via satellite include the following:

(a) Mobile communications via satellite are fast, reliable and of a high quality; the user is not affected by ionospheric perturbation or by the time delays associated with conventional radio calls;

(b) Satellite communications are simple and easy to use; a ship equipped with a ship Earth station (SES) can transmit a telex or make a telephone call directly to shore or to another ship equipped with an SES as easily as placing a call between two offices on land;

(c) Maritime satellites provide nearly global coverage (approximately 80° latitude North and South); thus a ship equipped with an SES is always within reach of a telex or a telephone call and can send a distress signal from virtually anywhere in the navigable waters of the world.

61. Fishing is one of the application areas that stand to benefit greatly from Standard-C mobile communications. A ship equipped with an SES would be able to provide 24-hour information on any event connected to its operations directly to the desk of the operation managers. In particular, through the INMARSAT system, a ship can send periodic reports on its position, speed and course to the fleet control centre and to the fishing authorities. Information such as the amount and type of species captured would allow the fishing authorities to establish a data base to optimize the fishery resources of the country as well as to monitor the activities of foreign fishing fleets.

62. Maritime authorities could also add daily information received from other satellites and data collection platforms to data banks that are accessible to the fishing fleet. This information could include maps of the sea surface temperature, sea temperature profiles, charts including plankton concentrations, environmental information, pollution, meteorological conditions, weather forecasts and ocean currents. Software packages and data are already commercially available that can provide (i) digitized maps using a Mercator projection, at scales that range from 1:5,000,000 to 1:1,000; (ii) determination of the shortest route between two points and pre-programmed control of navigation; (iii) calculation of tides in the principal ports; and (iv) creation of dedicated files containing all information relevant to a fishing plan.

E. Search-and-rescue applications

63. Radio communications have been a major contributor to safety of life at sea for 75 years. However, it is only within the last 13 years that there has been a quantum jump in communications capabilities. At present and in the near future, an important area of application of this technology will be in distress and safety situations, where mobile communications are becoming a valuable recognized asset. This technology will have a major role in the Global Maritime Distress and Safety System, which was developed by the IMO and has been included in amendments to the Safety of Life at Sea (SOLAS) Convention.

64. COSPAS-SARSAT is a co-operative programme between Canada, France, the Soviet Union and the United States that provides satellite assistance in search-and-rescue

operations for maritime, aeronautical and land vehicles anywhere in the world. The programme uses distress beacons fitted on mobiles (aircraft, ships, land vehicles) and four satellites that are operated by the USSR and the United States; these Satellites process or relay the distress signals to mission control centres, where the beacon positions are determined. From the control centres, the analysed information is forwarded in the form of an alert to the rescue co-ordination centres. Since its inception in 1986, the COSPAS-SARSAT programme has been instrumental in saving more than 1,500 human lives.

65. Vital to the COSPAS-SARSAT programme is the quick response provided by satellite communications. It has been shown through a number of surveys that in aircraft accidents when the victim needs to wait for rescuers for more than two days the probability of survival is only 10 per cent. The same probability rises to 60 per cent when the rescue effort takes place within eight hours. Mean survival time at sea is highly dependent on water temperature. Studies have shown that the mean survival time in waters of 5-10° C is less than 3 hours; this same time is less than 6 hours in waters at 10-15° C and less than 12 hours for waters at 15-20° C.

F. Disaster relief applications

66. According to UNDRO, between 1967 and 1987, 3 million lives were lost and property damage estimated at $US 23 billion was incurred as a result of natural disasters that affected more than 829 million people. Experience has shown that transmitting assessment and situation reports during the crucial first hours and days from a disaster-stricken area to UNDRO headquarters is often very difficult, especially from areas with damaged or non-operational communications systems.

67. Recent disasters in the ECLAC region confirm the above experience. Despite a well-implemented disaster preparedness and prevention plan, one day after Hurricane Hugo (1989) struck, UNDRO had to report that all communications had been cut and no detailed information on the damage was available. In the case of Hurricane Gilbert (1988) the situation was still worse. Although severe weather warnings had been issued more than 48 hours prior to the onset of the event, only ham radio communication was available for the first 72 hours of the disaster. In the case of the Mexico City earthquake of 1985, UNDRO was unable to transmit the assessment report to Geneva for several days because of complete damage to the local communications infrastructure. These situations indicate that, in spite of the availability of satellite communications technology, the stage of development, on a global level, is still in a transitional phase, ranging from experimental and limited operational conditions to those of widespread availability and extensive operational use.

68. In order to review the relevance of communications to disaster relief and mitigation and the actions that should be taken locally and internationally, UNDRO organized an International Conference on Disaster Communications at Geneva in March 1990. The Conference brought together potential users of emergency satellite communications with the producers and owners of these systems. The major needs in disaster communications identified by the Conference are reproduced in annex III to the present report.

Annex I

PROGRAMME OF THE WORKSHOP

Date	Time	Subject	Speaker
Monday 26 March	9.10 a.m.	Opening ceremony	
		Welcome address on behalf of the United Nations	N. Jasentuliyana
		Welcome address on behalf of the Government of Cuba	M. Castillo Rabasso
		Keynote addresses	
		Chairman: M. Garcia, Cuba	
	10.15-11 a.m.	Development of space communications in Cuba	R. Díaz (Cuba)
	11-11.45 a.m.	New communication technologies for development	L. Bransford (PSSC)
		Establishing a satellite communications infrastructure	
	11.45 a.m.-12.30 p.m.	Mobile communications for land, air and ship-to-shore services	J. Vilares-Leis (INMARSAT)
		Chairman: L. Perillán, INTELSAT	
	2-2.45 p.m.	The INTERSPUTNIK Satellite System	R. Valdés (Intersputnik)
	2.45-3.30 p.m.	Design, implementation and access via satellite to Telecommunication Statistical Data Bases on microcomputers	B. Humm (ITU)
	3.45-4.30 p.m.	University networks for access to data banks	A. Gómez (Mexico)
	4.30-5.15 p.m.	Networks and computers for the communications environment	K. Mallalieu (Trinidad and Tobago)
	5.15-5.45 p.m.	Reinforced plastic parabolic reflectors	R. López (Cuba)

Date	Time	Subject	Speaker
Tuesday 27 March		Applications potential of rural communications	
		Chairman: P. H. Pisani, France	
	9-9.45 a.m.	Rural communications networks for health care delivery	M. House (Canada)
	9.45-10.30 a.m.	Use of communications satellites in education programmes: the West Indies University experience	C. Marrett (Jamaica)
	10.45-11.30 a.m.	Use of communications satellites in education programmes	A. Obligado (Argentina)
	11.30 a.m.-12.15 p.m.	Discussion	
		Chairman: H. Lobeis, Dominican Republic	
	2-2.45 p.m.	Mission to America of the HISPASAT system: two television channels for the Americas	J. Díaz (HISPASAT)
		Rescue and disaster relief	
	2.45-3.30 p.m.	Use of satellite systems in disaster relief operations: recent examples (earthquakes, hurricanes, etc.)	J. Kraml (UNDRO)
	3.45-4.30 p.m.	The SARSAT/COSPAS programme: a search-and-rescue system using spacecraft	P. H. Pisani (France)
	4.30-5.15 p.m.	Italcable communication system	F. Muzzo (Italy)

Date	Time	Subject	Speaker
Wednesday 28 March		Elements of international/regional communications programmes and opportunities for the ECLAC region	
		Chairman: F. Muzzo, Italy	
	9-9.45 a.m.	The INTELSAT Assistance and Development Programme; satellite educational broadcasting systems	L. Perillan (INTELSAT)
	9.45-10.30 a.m.	Co-operation in space communications in the Latin America and Caribbean region	R. Sanatan (CARICOM)
	10.45 a.m.-12.30 p.m.	Working Group sessions	
		Chairman: K. Mallalieu, Trinidad and Tobago	
		Rapporteurs: A. Gómez, Mexico J. Alvarado, Cuba	
		Working group topics:	
		(i) Applications of satellite communications;	
		(ii) Possibilities of regional co-operation in the areas of satellite communications	
	2-5.30 p.m.	Working group sessions (continued)	
Thursday 29 March	9-10.30 a.m.	Working group sessions (continued)	
	10.30-noon	Visit to the Caribe Earth station	
	noon-2 p.m.	Lunch (official)	
	3-5 p.m.	Visit to EXPOCUBA Communications Pavilion	

Date	Time	Subject	Speaker
Friday 30 March	9-10.30 a.m.	Working group sessions (continued)	
	10.45 a.m.-12.30 p.m.	Working group sessions (continued)	
	2-2.45 p.m.	Plenary presentations of the working group recommendations Co-Chairmen: R. Díaz, Cuba S. Camacho, United Nations	
	3-3.30 p.m.	Closing ceremony	

Annex II

AGREEMENT OF THE FIRST IBERO-AMERICAN MEETING ON COMMUNICATIONS FOR CO-OPERATION, MADRID, 5-7 JUNE 1990

The participants agreed to:

1. Promote an Ibero-American co-operation project in the field of technology and the applications of telecommunications to the dissemination of programmes on education, science and culture as well as products and information services, including the creation for this purpose of a working group as indicated in the meeting.

2. Consult the Governments of the countries participating in this Meeting regarding their willingness to participate in the project and to invite the remaining Ibero-American countries to join it.

3. Take necessary actions for the preparation of the project, and involve national and international organizations dealing with communication, education, science, culture and information in the project.

4. Form sub-working groups to analyse the technical, legal, economic/financial and production and programming aspects of the project.

5. Create a secretariat, with its provisional venue in Madrid, to ensure the circulation of the information and documentation produced on the various aspects of the project and to organize the meetings necessary to carry out the functions of the Working Group.

6. Convene, within the period of one year, a second Meeting on Communications for Co-operation to discuss and approve, as appropriate, the co-operation project referred to.

Annex III

MAJOR NEEDS IDENTIFIED BY THE UNDRO INTERNATIONAL CONFERENCE ON DISASTER COMMUNICATIONS

(19-21 March 1990, Geneva)

1. Establish international agreements to facilitate entry and exit and operations of communications equipment by relief teams in stricken countries.

2. Establish international agreements on appropriate frequencies for disaster operations.

3. Involve ITU, where applicable, in establishing the process for protocols and standards for disaster communications operations.

4. Identify criteria for priority access to communications frequencies for emergency use and obtain agreements on priority access procedures.

5. Reduce the vulnerability of existing telecommunications infrastructures.

6. Ensure that the benefits of disaster communications and remote-sensing technologies be made available to countries so that they can develop or improve their own disaster communications infrastructure and, ultimately, manage their own mitigation efforts.

7. Links between search-and-rescue teams from different countries by a common network.

8. Availability of telecommunications facilities to ensure timely and accurate information, including damage and casualty assessments.

9. Develop approaches to offloading non-emergency traffic from the emergency network.

10. Negotiate with domestic and international communications carriers for a more favourable tariff structure than presently exists.

11. Develop philosophy and approach to payment for communications services required in disaster management efforts.

12. Devote greater attention than previously given to use of telecommunications and remote-sensing technologies in disaster prevention and preparedness.

13. Develop, maintain and update centralized clearinghouse for the collection and dissemination of accurate and timely information about telecommunications and remote-sensing technololgy and its application to disaster management.

14. Establish inventory of parameters and availability of equipment in countries at risk and other countries and institutions engaged in disaster relief operations.

15. Acquisition and operation of disaster communications and remote-sensing resources should be planned for and provided on a priority basis in the same context as other high-priority relief supplies.

16. Develop a programme for training disaster mitigation personnel in the use and maintenance of telecommunications and remote-sensing technologies.

17. Encourage countries to inventory their satellite and terrestrial telecommunications and remote-sensing hardware to establish their availability for disaster management purposes.

18. Develop options for reconstitution, within hours, of essential telecommunications capability.

19. Identify options for short-distance communications within the stricken area.

20. Develop the capability to deploy disaster communications equipment within a stricken area within 12 hours.

21. Ensure that an effective interface exists between a country's internal communications and its communications with other countries and institutions involved in disaster relief operations.

22. Countries at risk often lack adequate disaster communications infrastructure. Therefore, UNDRO should acquire and maintain its own mobile or portable terminals for its disaster relief operations and, possibly, for use by the stricken country.

23. Ensure adequate and reliable power sources for telecommunications equipment.